

**IN THE CLAIMS**

What is claimed:

1. A system comprising:
  - an interface coupled to a bus to receive a real time video stream;
  - a main processor coupled to the bus, the main processor to process a first group of video encoding tasks comprising those video encoding tasks not including variable length encoding involved with encoding the real time video stream;
  - a co-processor coupled to the bus, the co-processor to process a second group of video encoding tasks including variable length encoding tasks involved with encoding the real time video stream.
2. The system of claim 1 wherein the first group of video encoding tasks and the second group of video encoding tasks comprise those tasks required of at least one of the Moving Pictures Expert Group (MPEG) standards for video encoding.
3. The system of claim 1 wherein:
  - the first group of video encoding tasks comprises at least motion estimation, pre-processing, mode selection, forward discrete cosine transform computation, forward quantization computation, rate control, zig zag scanning, inverse discrete cosine transform computation, inverse quantization computation, and motion compensation; and
  - the second group of video encoding tasks comprises variable length encoding computation.
4. The system of claim 3 wherein the variable length encoding computation comprises:
  - macroblock header encoding;
  - motion vector encoding; and
  - discrete cosine transform coefficients encoding.
5. The system of claim 3 wherein the motion estimation comprises:
  - a first phase includes top to top searching and bottom to bottom searching; and

a second phase includes top to bottom searching and bottom to top searching.

6. The system of claim 3 wherein the pre-processing comprises:  
noise reduction.
7. The system of claim 1 wherein the co-processor is a variable length  
encoder/decoder co-processor.
8. The system of claim 1 wherein the interface is at least one of a broadcast  
interface and a network interface.
9. The system of claim 1 further comprising:  
an audio output interface; and  
a video output interface.
10. The system of claim 1 wherein the real time video stream is at least one of a  
television signal received wirelessly and a television stream received via a hardwired  
connection.
11. A system comprising:  
a main processor coupled to a bus;  
a co-processor coupled to the bus;  
a main memory coupled to the bus;  
an interface coupled to the bus to receive a real time video stream; and  
a storage device coupled to the bus, the storage device having instructions  
stored thereon which when executed by the main processor allocate a first group of  
video encoding tasks to the main processor and a second group of video encoding tasks  
to the co-processor.
12. The system of claim 11 wherein:  
the second group of video encoding tasks comprises variable length encoding  
tasks involved with encoding the real time video stream according to a well known  
standard; and

the first group of video encoding tasks comprises those video encoding tasks not including variable length encoding involved with encoding the real time video stream according to the well known standard.

13. The system of claim 12 wherein the well known standard is at least one of the Moving Pictures Expert Group (MPEG) standards for video encoding.

14. The system of claim 11 wherein:

the first group of video encoding tasks comprises at least motion estimation, pre-processing, mode selection, forward discrete cosine transform computation, forward quantization computation, rate control, zig zag scanning, inverse discrete cosine transform computation, inverse quantization computation, and motion compensation; and

the second group of video encoding tasks comprises variable length encoding computation.

15. The system of claim 14 wherein the variable length encoding computation comprises:

macroblock header encoding;  
motion vector encoding; and  
discrete cosine transform coefficients encoding.

16. The system of claim 14 wherein the motion estimation comprises:  
a first phase includes top to top searching and bottom to bottom searching; and  
a second phase includes top to bottom searching and bottom to top searching.

17. The system of claim 14 wherein the pre-processing comprises:  
noise reduction.

18. The system of claim 11 wherein the co-processor is a variable length encoder/decoder co-processor.

19. The system of claim 11 wherein the interface is at least one of a broadcast interface and a network interface.

20. The system of claim 11 further comprising:  
an audio output interface; and  
a video output interface.
21. The system of claim 11 wherein the real time video stream is at least one of a television signal received wirelessly and a television stream received via a hardwired connection.
22. A method for video encoding comprising:  
receiving a real time video stream;  
performing picture level and upper processing on a main processor;  
executing a macroblock loop in parallel on the main processor and a co-processor, wherein executing includes processing a first group of video encoding tasks on the main processor and processing a second group of video encoding tasks on the co-processor; and  
outputting an encoded version of the real time video stream.
23. The method of claim 22 wherein the video encoding is performed according to at least one of the Moving Pictures Expert Group (MPEG) standards for video encoding.
24. The method of claim 22 wherein:  
the first group of video encoding tasks comprises at least motion estimation, pre-processing, mode selection, forward discrete cosine transform computation, forward quantization computation, rate control, zig zag scanning, inverse discrete cosine transform computation, inverse quantization computation, and motion compensation; and  
the second group of video encoding tasks comprises variable length encoding computation.
25. The method of claim 24 wherein the variable length encoding computation comprises:  
macroblock header encoding;  
motion vector encoding; and

discrete cosine transform coefficients encoding.

26. The method of claim 24 wherein the motion estimation comprises:  
a first phase that includes top to top searching and bottom to bottom searching;  
and  
a second phase that includes top to bottom searching and bottom to top  
searching.

27. The method of claim 24 wherein the pre-processing comprises:  
noise reduction.

28. The method of claim 22 wherein:  
the second group of video encoding tasks comprises variable length encoding  
tasks involved with encoding the real time video stream according to a well known  
standard; and  
the first group of video encoding tasks comprises those video encoding tasks  
not included in the variable length encoding involved with encoding the real time video  
stream according to the well known standard.

29. The method of claim 22 wherein the co-processor is a variable length  
encoder/decoder co-processor.

30. The method of claim 22 wherein the real time video stream is at least one of a  
television signal received wirelessly and a television stream received via a hardwired  
connection.

31. A machine readable medium having instructions stored thereon which when  
executed by a main processor cause the main processor perform operations to encode a  
real time video stream, the operations comprising:

allocating a first group of video encoding tasks to the main processor; and  
allocating a second group of video encoding tasks to the co-processor.

32. The machine readable medium of claim 31 wherein the first group of video  
encoding tasks and the second group of video encoding tasks comprise those tasks

required of at least one of the Moving Pictures Expert Group (MPEG) standards for video encoding.

33. The machine readable medium of claim 31 wherein:

the first group of video encoding tasks comprises at least motion estimation, pre-processing, mode selection, forward discrete cosine transform computation, forward quantization computation, rate control, zig zag scanning, inverse discrete cosine transform computation, inverse quantization computation, and motion compensation; and

the second group of video encoding tasks comprises variable length encoding computation.

34. The machine readable medium of claim 33 wherein the variable length encoding computation comprises:

macroblock header encoding;

motion vector encoding; and

discrete cosine transform coefficients encoding.

35. The machine readable medium of claim 33 wherein the motion estimation comprises:

a first phase that includes top to top searching and bottom to bottom searching;

and

a second phase that includes top to bottom searching and bottom to top searching.

36. The machine readable medium of claim 33 wherein the pre-processing comprises:

noise reduction.

37. The machine readable medium of claim 31 wherein:

the second group of video encoding tasks comprises variable length encoding tasks involved with encoding the real time video stream according to a well known standard; and

the first group of video encoding tasks comprises those video encoding tasks not included in the variable length encoding involved with encoding the real time video stream according to the well known standard.

38. The machine readable medium of claim 31 wherein the co-processor is a variable length encoder/decoder co-processor.

39. The machine readable medium of claim 31 wherein the real time video stream is at least one of a television signal received wirelessly and a television stream received via a hardwired connection.

10020655-12101